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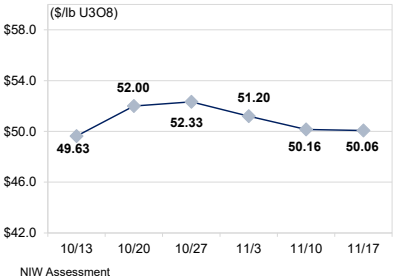
A US proposal that would sanction Russia's Rosatom and spend billions to procure nuclear fuel is no longer part of the fiscal 2023 defense budget but may find its way into the wider budget debate.

UPP: $50.06/LB U3O8



WEEKLY ROUNDUP

Republican-Controlled US House May Push Nuclear

- As Republicans prepare to take control of the US House of Representatives following national midterm elections, one incumbent Republican took the opportunity to present a three-page "Blueprint for Nuclear Innovation and Competitiveness." The proposal by South Carolina Rep. Jeff Duncan, a member of the House Energy and Commerce Committee, includes a "Made in America" system "to strengthen uranium mining and conversion" — including easing "regulatory restrictions to mining" — and incentives for domestic enrichment capacity. Other tenets of Duncan's plan include amending national energy policy to classify nuclear energy as a renewable resource, easing regulatory oversight for reactor operators, expediting environmental reviews, offering federal financing for spent nuclear fuel reprocessing, and a new push to site a permanent repository for the nation's nuclear waste at Yucca Mountain in Nevada. That proposal was previously revived under former President Donald Trump, before he reversed course. Duncan also calls for "actions to end reliance" on Russian supplies of enriched uranium, a proposal that is already working its way through Congress, although it has yet to secure a broader legislative vehicle for passage.

- The International Atomic Energy Agency (IAEA) Board of Governors passed on Nov. 17 a resolution this week expressing "profound concern" about Iran's "insufficient substantive cooperation" with the agency over undeclared nuclear activities dating back decades. The resolution, sponsored by France, Germany, the UK and the US, passed by 26 votes, with 5 abstentions (India, Namibia, Pakistan, Qatar and South Africa), 2 board members absent (Burundi and Kenya), and two opposed: China and Russia. "This is the second resolution adopted" by the board on these matters this year, the E3 and US said in a Nov. 18 statement. "In doing so, the Board has sent a clear message that it is essential and urgent" that Iran fulfills its nuclear nonproliferation treaty-required safeguards obligations "without delay." Russian Ambassador Mikhail Ulyanov wrote that "regardless of the intentions of its supporters," the resolution "created a more difficult environment around outstanding safeguards issues" and moribund talks to restart the 2015 Iran nuclear deal. "That's why Russia voted against."

- Credit Agricole's investment bank this week signed a €1 billion ($1 billion) credit agreement with EDF to fund the French state operator's "Grand Carenage" program to refurbish the French nuclear fleet and extend the life of its reactors beyond 40 years. This is "the first transaction in which the funds will be entirely dedicated to the investments made for EDF's nuclear activities" and is "the first of its kind worldwide in the energy transition field," EDF and Credit Agricole CIB said in a Nov. 18 joint statement. This proves that "EDF continues to innovate with its green finance tools," said EDF head of finance Xavier Girre. The loan covers only a small part of the Grand Carenage program, which EDF estimates at €50.2 billion over the years 2014-25, and which EDF has largely been funding off of its balance sheet and its general corporate debt. That figure excludes repair work on EDF's reactors impacted by the stress corrosion phenomenon, as well as work beyond 2025 — for which EDF is now preparing a roadmap.

NUCLEAR FUEL MARKET

Market Unmoved by Utility Demand

The uranium spot market held steady this week, even as two US buyers sought or picked up material for spot and term delivery, highlighting once again the outsized influence of investors and wider financial markets on the uranium spot price.

Energy Intelligence's Uranium Price Panel delivered an average price assessment of $50.06/per pound U3O8 for Thursday, Nov. 17, down from $50.16/lb. for Nov. 10.

The lack of upward movement in the spot price may prove beneficial for the two US utilities that tendered for uranium supplies late last week. NextEra's Florida Power & Light came out for 2 million lbs. U3O8 to be delivered at multiple locations from 2023-28, with bids due Monday, Nov. 14, and validity until Friday, Nov. 18. And Southern Co. sought 250,000 lbs. U3O8 for delivery in 2023 at Cameco's Port Hope facility in Canada.

Instead of tracking demand, the uranium spot market followed general energy and mining stocks lower, while a number of investors offloaded Canadian and US uranium shares. This in turn sent share prices for Sprott Asset Management's uranium trust (Sput) lower, below its net asset value. Under the fund's rules, this prevents it from selling shares and raising cash to add more uranium to its stockpiles.

Today, Sput holds 59.3 million lbs. U3O8. So far this month, the fund has only picked up 100,000 lbs. on Nov. 8 and another 100,000 lbs. on Nov. 11.

Sput's share price has increasingly traded at a discount to its NAV since the fund was launched in mid-2021. According to Sput's website, the fund traded at a premium only twice in the third quarter of this year, with 61 days traded at a discount. By comparison, in the first quarter, the fund traded at a premium for 35 days and 27 days at a discount. In the second half of 2021, the fund was at a premium for 79 days and a discount for 35.

While Sprott has consistently tried to assuage industry concerns that it would not sell off material, the more the fund underperforms, the more it raises questions among fuel market participants and suppliers that Sput could end up dumping millions of pounds into the market.

Meanwhile, in the US, the prospect of sanctions on Russia's Rosatom along with billions in funding to support domestic nuclear fuel procurement has once more been shelved. Sens. Joe Manchin, a centrist Democratic senator from West Virginia, and long-time domestic nuclear fuel industry advocate John Barrasso, a Wyoming Republican, on Sep. 30 introduced a phased ban on Russian nuclear fuel imports. The bill includes $3.5 billion in funding for the US Department of Energy's proposed domestic nuclear fuel procurement program, otherwise known as the American Assured Fuel Supply program, in an attempt to offset Russian supply.

That legislation was folded into an amendment to the fiscal 2023 US Department of Defense budget. Energy Intelligence understands that the amendment, including the ban and the $3.5 billion for fuel procurement, has been omitted from the Defense budget, which was expected to go to a vote after the midterm elections.

Now the proposal is once again being reconsidered, and "an omnibus is the more practical vehicle at this point," a source close to the matter said. The proposed bipartisan legislation represents a phased approach to sanctions on Rosatom, in part by providing an avenue for US utilities to request an exemption to the ban if they can show "no viable source of alternative supply." Even that waiver would expire by the end of 2025.

Whether the proposals make their way into the fiscal 2023 budget will depend on the current lame-duck Congress, which has until Dec. 16 to either pass a full spending package or another continuing resolution to fund the government beyond that date.

There is some debate among insiders on Capitol Hill and in the Department of Energy as to whether there is enough enriched uranium and enrichment capacity available to the US nuclear fleet to sanction Rosatom today. If not, any official ban risks Moscow preemptively and immediately halting Russian nuclear fuel supplies, which make up roughly 20% of US demand.

Jessica Sondgeroth, Washington

URANIUM PRICE PANEL

For the week ended November 17, 2022

Weekly Spot Market Prices

		Nov			Oct				Sep					Aug
	Chg.	17	10	3	27	20	13	6	29	22	15	8	1	25
Price ($/lb U3O8)	-0.09	50.06	50.16	51.20	52.33	52.00	49.63	47.88	48.54	49.82	50.03	51.83	52.50	48.38
Total Assessments	-1.00	*10.00*	*11.00*	*8.00*	*9.00*	*10.00*	*12.00*	*9.00*	*8.00*	*10.00*	*10.00*	*8.00*	*8.00*	*9.00*
% within 1 StDev	17.27	*90.00*	*72.73*	*62.50*	*66.67*	*70.00*	*83.33*	*77.78*	*87.50*	*60.00*	*70.00*	*75.00*	*62.50*	*77.78*
Low ($/lb U3O8)	0.10	50.00	49.90	50.00	51.90	51.50	49.00	47.50	48.25	49.00	49.00	51.25	52.00	48.00
High ($/lb U3O8)	-0.75	50.25	51.00	52.20	53.00	52.50	50.50	48.25	49.00	51.00	51.00	52.00	53.50	49.00
Variability*	-0.34	0.13	0.46	0.62	0.11	0.25	0.75	0.07	0.08	1.00	0.38	0.19	0.39	0.38

*This represents the value of the potential range of conceivable final averages that might result when random elimination is used to balance market positions within the panel.

UKRAINE

Russian Attacks Disconnect Khmelnitski From Grid

A second nuclear power plant in Ukraine was forced off the grid this week due to air attacks in the Russian invasion of the country. The Nov. 15 air attacks knocked out connections to the external power grid of the Khmelnitski nuclear power plant, forcing the four-unit plant to rely on backup diesel generators for nine hours before grid connection was restored. The incident echoes the barrage of intermittent missile fire at the larger Zaporizhzhia nuclear plant, where the International Atomic Energy Agency (IAEA) is closer to securing a security zone.

The Nov. 15 attacks came as IAEA Director General Rafael Grossi claimed to be closing in on an agreement for a security zone at Zaporizhzhia, and underlined the sobering fact that even if such an agreement is reached, broader nuclear safety concerns will remain as long as the war continues. The Ukraine war entered a brutal new phase a month ago, as Moscow started bombing critical infrastructure across Ukraine in response to a successful Oct. 8 Ukrainian attack on the Crimean Bridge. The Russisan bombing campaign is now impacting the operation of Ukraine's nine operating power reactors, beyond the six-unit Zaporizhzhia plant that was occupied by Russian forces in early March — in the opening days of the current war — and illegally expropriated by the Russian government on Oct. 5.

"Since the beginning of October, this is the sixth massive attack on the country's energy infrastructure, this time the largest: about a hundred missiles," Volodymyr Kudrytskyi, chairman of Ukraine's power grid operator Ukrenergo, said in a Nov. 15 statement. "Each missile flew with the aim of plunging Ukraine into darkness."

In the case of Khmelnitski, which is home to four Soviet-supplied VVER-1000 reactors, the four power lines connecting the plant to the outside grid were progressively lost over 2½ hours on Nov. 15, until all grid connections were cut by 6:35 p.m. The plant was forced to rely on diesel generators for backup power, and two reactors were shut down. But Ukraine's grid workers are efficient at repairing damaged transmission lines, and by 3:45 am the next morning — nine hours after the plant lost external power supplies — Khmelnitski was reconnected to two 330 kilovolt backup power lines.

The Nov. 15 attack also caused the four-unit Rovno nuclear plant to lose one of its 750 kV power lines, prompting operator Energoatom to reduce the plant's output and disconnect one of its units. This means that all four of Ukraine's operating nuclear plants have now been impacted by fighting; in the early hours of Sep. 19 a missile exploded near the three-unit South Ukraine plant, blowing out 100 windows and impacting three power lines at the site. But Khmelnitski appears to be the first plant beyond Zaporizhzhia forced to rely on emergency diesel generators for its power thanks to attacks on the grid.

"This was a very concerning development," Grossi said in a Nov. 16 statement, as it "shows the potential nuclear safety and security risks facing all of Ukraine's nuclear facilities during this terrible war, not just" Zaporizhzhia. "While offsite power is now back" at Khmelnitski, "yesterday's power loss clearly demonstrates that the nuclear safety and security situation in Ukraine can suddenly take a turn for the worse, increasing the risk of a nuclear emergency."

On Nov. 17 the IAEA Board of Governors passed a resolution sponsored by Canada and Finland calling on Russia to "cease all actions against and at nuclear facilities in Ukraine" and refusing to recognize any Russian ownership of Zaporizhzhia. The resolution was approved by 24 board members, with China and Russia opposed. But key board members were pushing for further actions in Vienna beyond just the resolution.

"Russia is solely responsible for the nuclear safety and security issues in Ukraine and for putting at risk the safety of millions who would be affected by a nuclear incident," UK Ambassador Corinne Kitsell told the board, while her US counterpart Laura Holgate explained that the US was now coordinating with the IAEA secretariat to assure that "to the maximum extent practicable" US-contributed extrabudgetary funding not fund "direct participation of Russian officials in IAEA activities." Holgate said "we hope others will join us to apply pressure on Russia, beyond the adoption of today's board resolution."

Inching Toward a Zaporizhzhia Security Zone

Meanwhile at Zaporizhzhia, Grossi claims that a deal for a security zone might be close. "If we can have the zone, which I really hope will be the case, you will not discover a 24-page agreement with annexes," Grossi said in a Nov. 16 press conference. "It's a very simple thing that will reflect a very serious political commitment of both sides to stop something which is still taking place." And "what we are proposing is very simple: don't shoot at the plant, don't shoot from the plant." More specifically Grossi said that the main issues still to be resolved are "related to the military equipment" at or near the plant or are "related to the radius of the zone."

But while such an agreement would lessen the risks of major catastrophe at Zaporizhzhia, it addresses only one pillar of the seven pillars of nuclear safety during conflicts that Grossi outlined earlier this year: physical integrity. Other pillars include secure offsite power supply from the grid — something that has now been lost at both Zaporizhzhia and Khmelnitski, and that has been threatened at South Ukraine and Rovno — and the ability of operating staff to fulfill their safety and security duties, with the capacity to make decisions free of undue pressure.

That pillar has been undermined by the Russian occupation and expropriation of Zaporizhzhia, and this would likely not be ameliorated by a security zone. The impossible situation facing

Zaporizhzhia staff was highlighted by the IAEA in a Nov. 14 note, issued before this week's massive attacks, reporting on an internal plant conflict last week. Zaporizhzhia staff proposed starting Zaporizhzhia-6 to provide more steam while not producing electricity, and this request was approved by Ukraine's nuclear regulator in Kyiv. But the Russian operating organization in place since last month refused to allow the restart, and Unit 6 remained in hot shutdown.

The Ukrainian staff at Zaporizhzhia "are carrying out their vital tasks under constant pressure," which "can have a negative impact on nuclear safety and security and increase the risk of a nuclear accident," said Grossi. "Exacerbating the situation, they are now also faced with conflicting instructions on how to run the plant."

Phil Chaffee, London

BRAZIL

Restarting Angra-3 Civil Works

Brazil's Eletronuclear resumed civil construction works at the Angra-3 newbuild on Nov. 11, seven years after the project was mothballed for the second time amid the fallout of a corruption scandal. The resumption follows the recent election of Luiz Inacio Lula da Silva, who previously revived work on Angra-3 just before his prior term as president ended in 2010. While Lula is likely to be supportive of the project moving forward after he takes office on Jan. 1, Eletronuclear must still contract the bulk of electromechanical engineering work, and that's not expected before 2024.

The on-again/off-again project to build the German-designed 1,405-megawatt Angra-3, on which construction first commenced in 1980, will likely maintain government support given Lula's previous support and more recent signals. Eletronuclear is still targeting 2028 for commissioning of Angra-3, which it hopes to jump-start in part by accelerating the plant's "Critical Line Acceleration Plan" by contracting local suppliers. In 2021 Eletronuclear spent 1.24 billion real ($233 million) contracting for Angra-3 civil works, and in February 2022 it signed a contract with a consortium—comprising Brazilian contractors Ferreira Guedes and Matricial and electromechanical engineering company ADtranz—for construction works including completion of the reactor building by 2025, electromechanical work to close the steel containment structure, and installation of a spent fuel pool.

Even as Eletronuclear proceeds with civil works, however, it doesn't intend to conclude an engineering, procurement and construction (EPC) contract before 2024, once more pushing back that timeline. In part that's because much of the construction work is already going forward — with the project about 63% complete — and EDF subsidiary Framatome, which owns Angra-3's nuclear island technology, is already serving as the project's design authority. What Eletronuclear requires from an EPC contractor then will therefore largely entail electromechanical engineering work, with little procurement and construction.

Former Eletronuclear CEO Leonam Dos Santos Guimaraes told Energy Intelligence in September that an EPC contract for Angra-3 would most likely go to a "consortium involving especially big construction companies, and not necessarily our well-known nuclear companies like Westinghouse, Rosatom and CNNC," but more specialized contractors "like in the United States, Jacobs and Fluor, and also in France, like Bouygues, and in China, we have this particular company specialized in construction of nuclear power plants, not CNNC who designs and builds the plant."

Such prospective bidders are already wary of taking on any construction risk at the troubled project, even before an EPC tendering process has begun and even given the limited EPC scope. "We found out that the main issue for potential bidders and for the success of such a bid is a good risk allocation," Marcelo Gomes da Silva, Eletronuclear's head of advisory department for science, technology and generation expansion, told a New Nuclear Watch Institute Nov. 17 webinar on Latin America. "If you put too much risk on the industry side," he explained, "you may have either the higher price or even an unsuccessful bid. If you put too little risk, you have a very high tariff for the consumer in the end."

Financing Challenges

In the previous chapter of Angra-3's construction, work on the reactor was halted in 2015 thanks to "delays" in Framatome's predecessor Areva being paid, lack of financing and a corruption scandal that implicated many of the project's Brazilian suppliers as well as Eletronuclear officials. It's not clear what is being done to remove corruption risks at the project, but under the current government, state-owned Brazilian Development Bank (BNDES) outlined a project financing structure that does not ask prospective EPC partners for equity contributions as previous models did. Instead, it relies on debt-financing by guaranteeing project loans: Angra-3 would be supported by 80% debt financing through project loans and hopes of financing through international partners.

That financing structure doesn't appear to be at risk of changing under a left-wing Lula government. Eletronuclear expects Lula will continue to support a mix of national and international financing. "Let us remember that it was under President Lula's tenure in the past that the Angra-3 project was started and gained momentum," Eletronuclear's Gomes da Silva said in response to questions from Energy Intelligence. "And regarding the financing structure, I think that the current constraints on national budget" calls "for a market solution" including a "financing structure based on bank loans and bonds."

Now BNDES is reviewing government-approved guidelines for establishing yet another output tariff for the plant, one that must

cover both capital costs, currently estimated at 18.8 billion reals ($3.3 billion), the project's existing debt, and an 8.88% return on equity.

As proposed by BNDES, that 18.8 billion real capital cost is to be covered via 5.4 billion real ($995 million) from former Eletronuclear parent company Eletrobras, 3.5 billion real ($645 million) from new owner, the Brazilian Company for Participation in Nuclear and Binational Energy (ENBPar), and 9.5 billion real ($1.7 billion) from debt financing. These capital spending figures were agreed upon as part of the privatization of Eletrobras and the restructured ownership of Eletronuclear under ENBPar.

ENBPar was established by government decree on Sep. 10, as part of the 23.2 billion real initial privatization of Eletrobras, Brazil's largest power and utilities firm. While Lula has pledged to make Eletrobras a state-owned entity again, budget constraints could limit that possibility. Eletrobras currently maintains a 36% minority stake in Eletronuclear, with ENBPar holding the majority at 64%, but in terms of capital spending, Eletrobras is on the hook for about 68% of Angra-3 costs and ENBPar the rest.

Eletrobras said in its May 9 annual report that while it commits "to raise funds and grant guarantees in proportion to our participation in the voting capital of Eletronuclear," the company cannot provide assurances that it "will obtain the funds necessary to meet our investment obligations or that ENBPar will be able to obtain all the necessary funds and guarantees, which could adversely affect the completion of the project."

Jessica Sondgeroth, Washington

UNITED KINGDOM

Sunak Government Backs Sizewell C

UK Chancellor Jeremy Hunt gave firm backing this week to EDF's project to build twin EPRs at Sizewell C, ending speculation that the new UK government might back away from the expensive newbuilds, which need government investments to proceed. France's state-owned EDF now aims to reach a final investment decision (FID) within 18 months, although even with backing from both the French and UK governments, this likely still requires private investors to buy into the project.

"Today I can announce the government will proceed with a new nuclear power plant at Sizewell C," Hunt told the House of Commons on Nov. 17, as he released the "mini budget" revealing how the government of Prime Minister Rishi Sunak plans to weather severe economic headwinds. "Subject to final government approvals, the contracts for the initial investment will be signed with relevant parties, including EDF, in the coming weeks." Hunt said that "our £700 million [$834 million] investment is the first state backing for a nuclear project in over 30 years, and represents the biggest step in our journey to energy independence."

That's essentially a reconfirmation of the funding outlined by Boris Johnson, the prime minister who promised 24 gigawatts of new nuclear, starting with the Sizewell C project in Suffolk, in southeast England. Johnson's early departure from office in September was followed by the short, disastrous premiership of Liz Truss, who in turn was succeeded by Sunak. On Nov. 4 the BBC had reported that Sunak's government was reviewing the commitment to Sizewell C, but this prompted an almost immediate denial from Sunak's spokesperson. Hunt's comments this week place Sizewell C and nuclear power at the center of the government's energy policy: the UK needs "a major acceleration of homegrown technologies like offshore wind, carbon capture and storage, and above all, nuclear," he told Parliament, to applause.

Hunt's commitment, particularly in the context of the broader austerity measures he announced, prompted immediate pushback from project opponents. "Green lighting Sizewell C also loads more tax onto struggling households, who would be forced to pay a nuclear levy on bills for a decade before they could light a single lightbulb," the group Stop Sizewell C said in a statement, referring to the regulated asset base model that will allow a Sizewell C project company to collect revenues from ratepayers during the construction phase. "Despite the chancellor's statement, Sizewell C still needs financing, and with at least a year before it's decided whether it will finally go ahead, we'll keep fighting this huge black hole for taxpayers' money, when there are cheaper, quicker ways to get to net zero."

Uncertain Timelines and Energy Systems

Indeed, financing is no sure thing. Whitehall and EDF are now likely to each take 50% stakes in the Sizewell C project company, in a deal negotiated last month by Truss and French President Emmanuel Macron, and reported by the FT. "You will have seen from the press that an announcement is anticipated that the government will take 50% of the shares in Sizewell, alongside EDF keeping 50% of the shares," Julia Pyke, EDF's director of finance for Sizewell C, told Parliament's Science and Technology Select Committee in Nov. 2 testimony. "The project will get going physically in this format, and then we hope to take a final investment decision in 12-18 months' time."

EDF envisions construction of the Sizewell C reactors taking 10-12 years, which means that without construction delays the first unit could be operating by 2035 if an FID is reached next year. But that's an uphill climb: Pyke said that before FID "we would of course have to take account of macroeconomics and wait for pension fund positions to settle down." That implies that while some early site works can pick up following a UK government investment in the Sizewell C project company, both FID and what Pyke called the "sort of quantum" of capital spending to come after FID would be dependent on at least EDF selling down its equity position to investors such as pension funds. For some time now EDF has made clear that a Sizewell C FID is dependent on EDF selling down its equity ownership in the project to below 20%.

How Sizewell C will integrate into the UK's future power system is still an open question. Paul Spence, the director of strategy and corporate affairs for EDF's UK operations, told the same Nov. 2 Science and Technology Select Committee hearing that "our central expectations" are that Sizewell C, the twin EPRs already under construction at Hinkley Point C and the 1,200 megawatt pressurized water reactor at Sizewell B "would run, predominantly, all the time, because the system will need them to run all the time." But Spence conceded that "we're starting to think about flexibility and options for a future system."

At Sizewell C EDF is therefore preparing two measures that could allow the planned EPRs greater flexibility. "The reactor can load follow within about 30 minutes to between 50%-60% of its output," said Pyke, "but the much more effective way we intend to achieve flexibility is by configuring the substation." Changing the wiring of the substation would allow Sizewell C "to supply energy to the national grid when it's needed for the grid," and alternately "to provide electricity into hydrogen electrolysis, for example."

EDF is also adding a valve to the Sizewell C EPRs that will allow — if wanted — diversion of some of the heat produced by the enormous reactors. "If you take 400 MW thermal of heat out of Sizewell [C], which is consistent with the safety case, then you have very little impact on electrical output," said Pyke, and "your heat's very cheap." That 400 MW thermal of clean steam could then feed into "the direct air capture technology which we're developing" and this "would offset the entire emissions of the UK's rail industry."

Phil Chaffee, London

ENRICHMENT

Urenco's Tails Processing Challenges and Opportunities

Deconversion of depleted uranium, the "tails" byproduct of uranium enrichment, is a process that both government contractors and commercial players find difficult to master. In the US, contractors have for the past decade floundered in the operation of plants in Ohio and Kentucky dedicated to deconverting the US government's legacy tails. And European enricher Urenco continues to struggle in the commissioning of its UK Tails Management Facility (TMF). However, should Urenco succeed in turning around the TMF, it might in the future pose a compelling commercial alternative for disposition of US legacy tails.

Urenco's TMF plant in Capenhurst, England, and the US Department of Energy (DOE) deconversion plants in Paducah, Kentucky, and Portsmouth, Ohio, are each designed to deconvert depleted uranium into stable uranium oxide for long-term storage and eventual permanent disposal. But tails deconversion is a messy process involving radioactive and unstable compounds and highly corrosive and toxic chemicals, including fluorine.

Even though the TMF was officially started up in mid-2019 for the deconversion of tails from its three European enrichment plants, as of Jun. 30, 2022, the amount of tails deconverted at the TMF "is not significant," Urenco said in its recent filings. And while Urenco's TMF may have deconverted limited amounts of depleted uranium since then, Energy Intelligence understands that TMF continues to experience challenges in the plant's already delayed ramp-up to 7,000 tU per year. Still, Urenco is already contemplating shipping tails from its US enrichment plant to the TMF, in part due to long-term problems deconverting tails in the US.

In the US, the DOE'S Office of Inspector General estimated in a Nov. 1 audit that it could take until 2054 — some 18 years more than initially planned — to complete the deconversion of legacy tails from the mothballed gaseous diffusion plants in Paducah, Portsmouth, and Oak Ridge, Tennessee. Deconversion operations began at Portsmouth in 2010 and Paducah in 2011, at a cost of more than $1 billion, and since then DOE has only converted 11% of the 800,000 metric ton government inventory.

The DOE Gravy Train

The remediation work at these sites, which goes beyond the deconversion plants, has led to an inevitable gravy train of cost-plus contracts for government contractors, and as always this has led to enormous cost escalations. When DOE contractors began deconversion operations in 2010, the agency estimated it would take $4.6 billion and 25 years, or until 2036, to deconvert the legacy tails.

In 2019 DOE revised its baseline, estimating "that it would then take an additional 18 years, through 2054, to convert the full DUF6 inventory" at a cost of about $11.7 billion, "more than two and a half times higher than its original estimate," according to the internal DOE report. And the Covid-19 pandemic has further exasperated operations, with the plants shut down for about 21 months, adding another $152 million in costs.

Currently the DOE's deconversion work is being carried out by Mid-America Conversion Services, a joint venture of Atkins, Westinghouse and Fluor that is contracted to operate the deconversion plants from 2017 through March 2023. In May the DOE tendered for a new deconversion contractor to take over the work through 2028, and possibly through 2033, for a cost-plus contract valued at $2.9 billion over 10 years.

A Commercial Alternative?

Urenco is unlikely to bid on that work, but if it manages to turn things around at the TMF, it could conceivably by 2028 or 2033 offer the DOE a tempting alternative to the troubled deconversion

plants onsite: shipping the legacy tails to the UK TMF. The European enricher is already seeking to demonstrate the viability of alternative methods and routes for deconversion and disposal, including shipping its tails from New Mexico to the UK for TMF deconversion. It would then transport the resulting stable oxides to DOE's federal waste site located at Waste Control Specialists in Andrews, Texas, for permanent disposal.

In May, Urenco filed an application with the US Nuclear Regulatory Commission (NRC) to export tails from New Mexico to Capenhurst, as "part of a pilot project to test the processes and route for deconversion and final disposition" of the UUSA material. On Sep. 14, the NRC granted the export license, which will cover the export of eight cylinders containing a total of 100 tons of depleted UF6 and 68 tons of depleted uranium to Capenhurst.

Urenco's three European enrichment plants produce about 13.4 million SWU per year, which generates about 14,800 tU of tails. While the Capenhurst TMF has a current planned capacity of 7,000 tU/yr with the operation of two kilns, it could double capacity to add another two kilns — assuming Urenco can get the plant to function as designed. That would bring the plant up to 14,000 tU, which essentially would allow it to deconvert all the tails generated on an annual basis at its enrichment plants in the UK, Germany and the Netherlands.

Urenco could add more kilns to process the 3,300 tU of tails from the 3 million SWU produced annually at Urenco's US enrichment plant. If Urenco can get TMF fully operational, and add capacity, there is a commercial argument to suggest Urenco could solicit a toll conversion agreement with the DOE to help process US legacy tails.

TMF's Teething Issues

First, of course, Urenco must right the ship at the TMF. At a cost of €1.15 billion ($1.2 billion), the construction of TMF was substantially completed in 2018. But ongoing operational issues continue to weigh on the company's balance sheet. From 2019-21, the company spent a total of €104 million on TMF, with another €9.5 million spent in the first half of this year. And there are still questions about the plant's economics.

"A key area of uncertainty remains the unit cost of deconversion in Europe which will remain uncertain until such time that the TMF project has been completed and the deconversion plant has been commissioned," Urenco said in its recent filings.

Energy Intelligence understands that the continued operational issues may be related to the adjustment of process parameters including temperature, pressure, and flow rates, as the plant design may not always translate to plant operations.

A Urenco spokesperson told Energy Intelligence this week that the "plant has successfully completed a number of planned outages for maintenance, as well as 'early life' and statutory inspections over the course of 2022 with no major concerns identified," adding that "deconversion targets for 2023 have been agreed" but declining to quantify those targets.

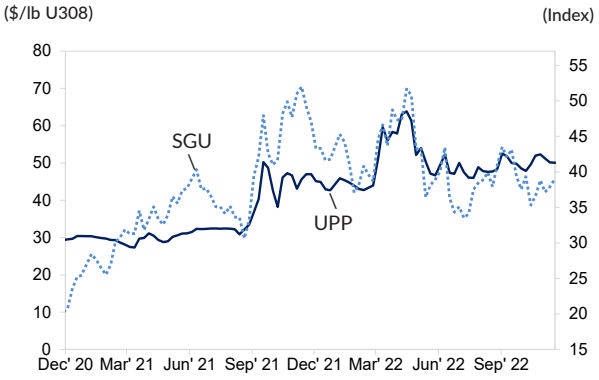
Jessica Sondgeroth, Washington

URANIUM MARKET UPDATE

All prices as of Thursday, November 18, 2022

UPP VS. SOLACTIVE GLOBAL URANIUM INDEX

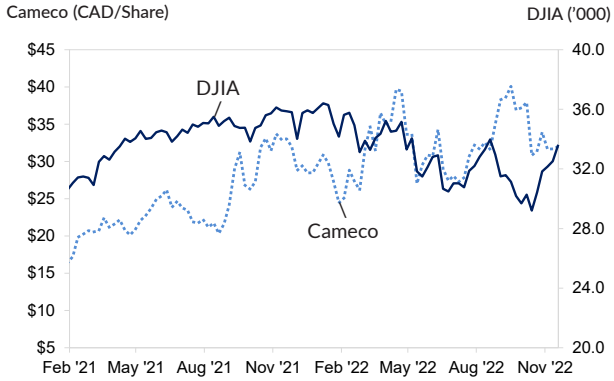
(previous 52 weeks)



The Solactive Global Uranium Total Return Index, created by Structured Solutions AG, tracks the price movements in shares of companies active in the uranium mining industry. Calculated as a total return index and published in US$, its composition is ordinarily adjusted twice a year.

CAMECO VS. DOW JONES INDUSTRIAL AVERAGE

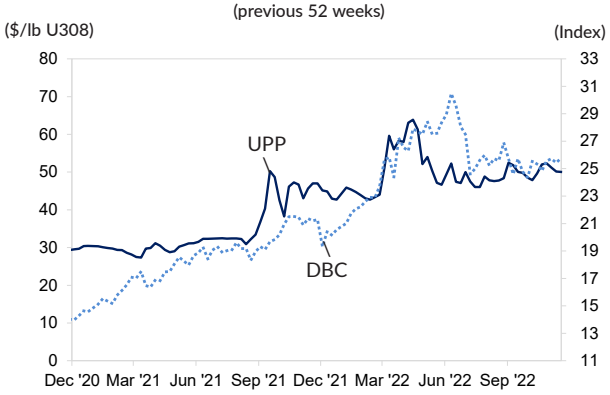
(previous 52 weeks)



Canadian uranium miner Cameco's stock is valued in Canadian dollars compared with the US dollar on the Dow Jones Industrial Average (DJIA). Roughly two-thirds of DJIA's 30 component companies are manufacturers of industrial and consumer goods. The others represent industries ranging from financial services to entertainment.

UPP VS. POWERSHARES DB COMMODITY INDEX

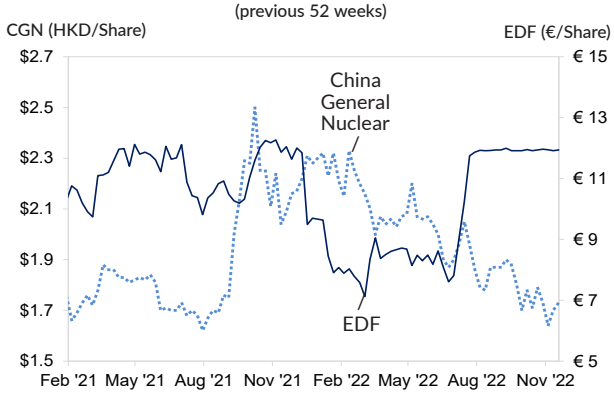
(previous 52 weeks)



The PowerShares DB Commodity Index Tracking Fund is designed to provide investors with a broadly diversified exposure to the returns on the commodities markets. It is based on the Deutsche Bank Liquid Commodity Index, which is composed of futures contracts on 14 of the most heavily traded and important physical commodities.

EDF VS. CHINA GENERAL NUCLEAR

(previous 52 weeks)



The stock valuation of France's Electricite de France (EDF), largely owned by the French state, is in euros compared to state-owned China General Nuclear (CGN) Power Co., valued in Chinese yuan renminbi. Both companies build nuclear power facilities, design and service reactors, operate nuclear reactors and supply nuclear components and technology.

MONTHLY SPOT MARKET PRICES

		2022										2021	
	Chg.	Oct '22	Sep '22	Aug '22	Jul '22	Jun '22	May '22	Apr '22	Mar '22	Feb '22	Jan '22	Dec '21	Nov '21
Uranium ($/lb U3O8)													
Low	-1.00	47.50	48.50	47.50	45.50	45.50	46.00	52.50	51.00	42.50	43.00	42.00	43.00
High	+0.25	52.75	52.50	53.50	50.50	52.50	54.00	64.00	60.00	44.50	46.50	47.00	47.50
Conversion ($/kgU)													
Low	+2.00	38.00	36.00	36.00	32.00	30.00	30.00	28.00	26.00	16.00	16.00	16.00	15.00
High	+3.00	42.00	39.00	39.00	37.00	33.00	33.00	30.00	28.00	17.00	17.00	17.00	18.00
Enrichment ($/SWU)													
Low	+1.00	93.00	92.00	90.00	89.50	84.00	84.00	82.00	100.00	59.00	57.00	56.00	56.00
High	-	96.00	96.00	92.00	95.00	150.00	150.00	150.00	150.00	61.00	59.00	57.00	57.00

NIW monthly UF6, SWU and U3O8 prices rely on the general consensus of direct market participants and is informed by actual market transactions. This section was previously known as the Nukem Weekly Report and the Nukem Price Bulletin. The methodology for NIW's weekly UPP price is different – more information about the methodology behind that price is available on page two.

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